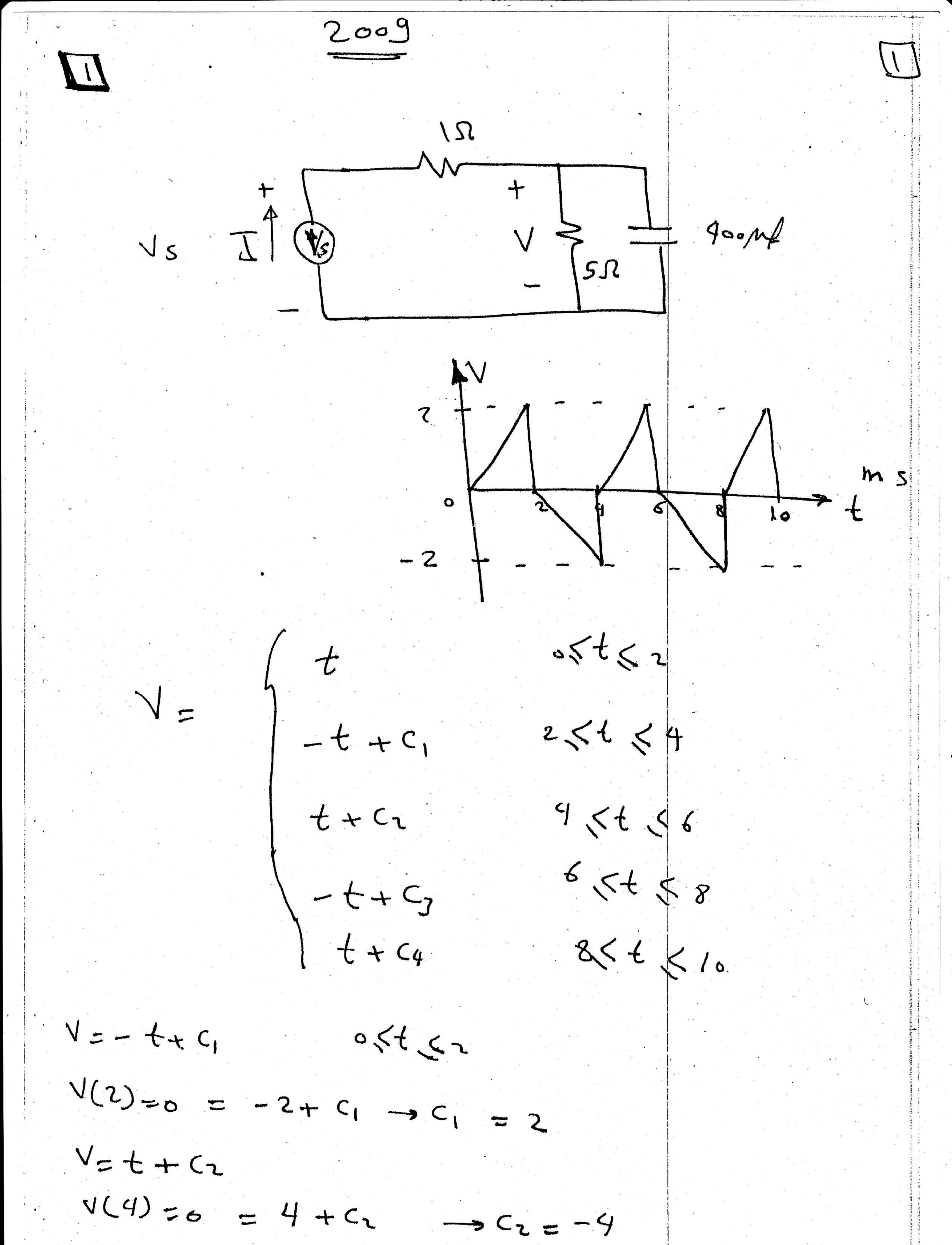


$$V = \begin{cases} t & 0 \leq t \leq 2 \\ -t + c_1 & 2 \leq t \leq 4 \\ t + c_2 & 4 \leq t \leq 6 \\ -t + c_3 & 6 \leq t \leq 8 \\ t + c_4 & 8 < t \leq 10 \end{cases}$$

$V = -t + c_1 \qquad 0 \leq t \leq 2$

$V(2) = 0 = -2 + c_1 \rightarrow c_1 = 2$

$V = t + c_2$

$V(4) = 0 = 4 + c_2 \rightarrow c_2 = -4$

$V = -t + c_3 \qquad 6 \leq t \leq 8$

$V(6) = 0 = -6 + c_3 \longrightarrow c_3 = 6$

$V = t + c_4 \qquad 8 \leq t \leq 10$

$V(8) = 0 = 8 + c_4 \longrightarrow c_4 = -8$

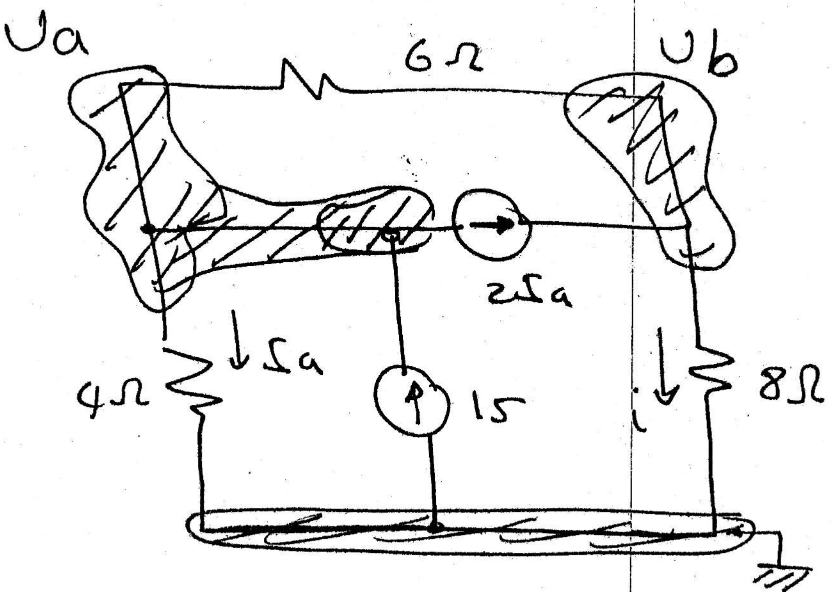
$$\therefore V = \begin{cases} t & 0 \leq t \leq 2 \\ -t + 2 & 2 \leq t \leq 4 \\ t - 4 & 4 \leq t \leq 6 \\ -t + 6 & 6 \leq t \leq 8 \\ t - 8 & 8 \leq t \leq 10 \end{cases}$$

$\therefore I = I_R + i_C$

$$= \frac{V}{R} + c\frac{dv}{dt}$$

$\therefore V_S = I \times 1\Omega + V$

2



① Node methode

at node Ua

$$15 - 2I_a = \frac{U_a - U_b}{6} + \frac{U_a - 0}{4}$$

at Ub

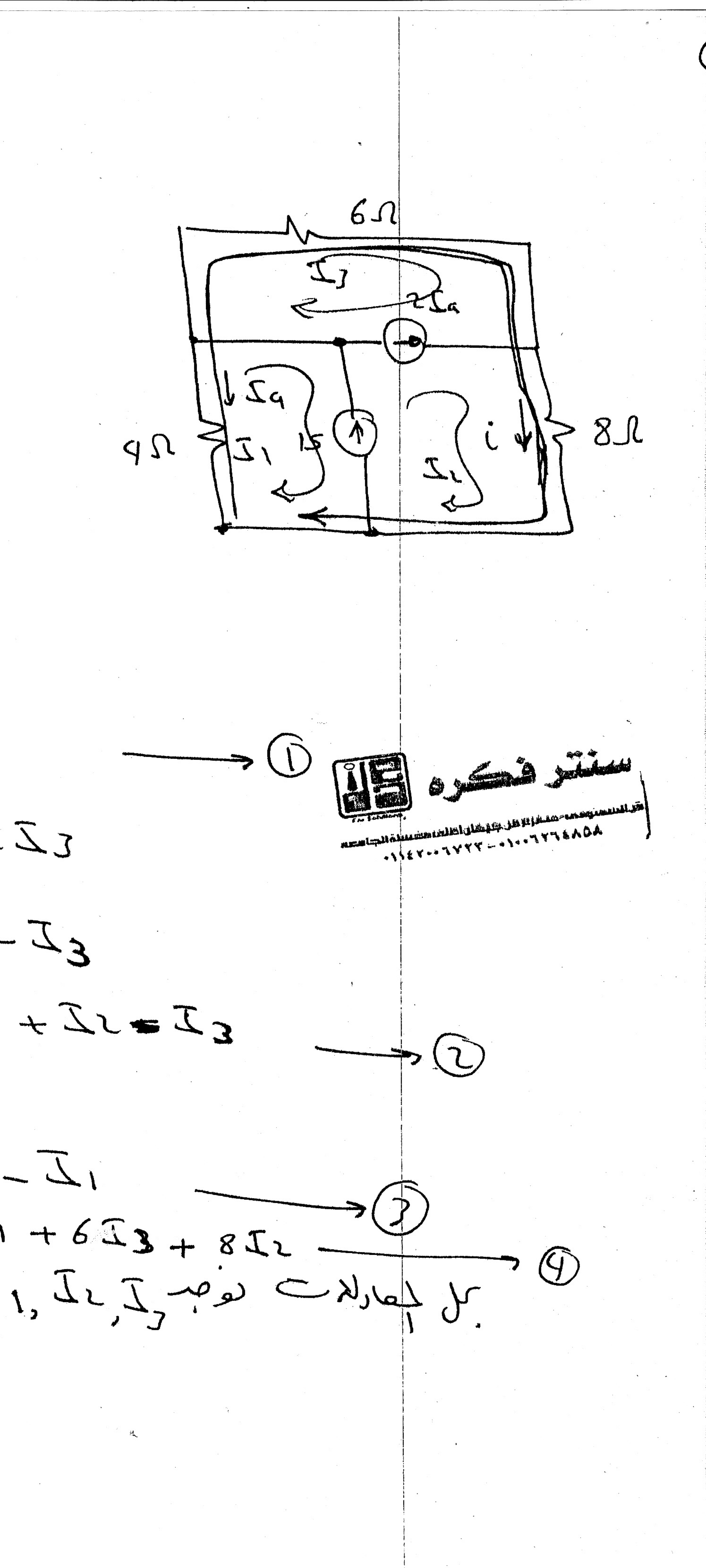
$$2I_a = \frac{U_b - U_a}{6} + \frac{U_b - 0}{8}$$

$$I_a = \frac{U_a}{4}$$

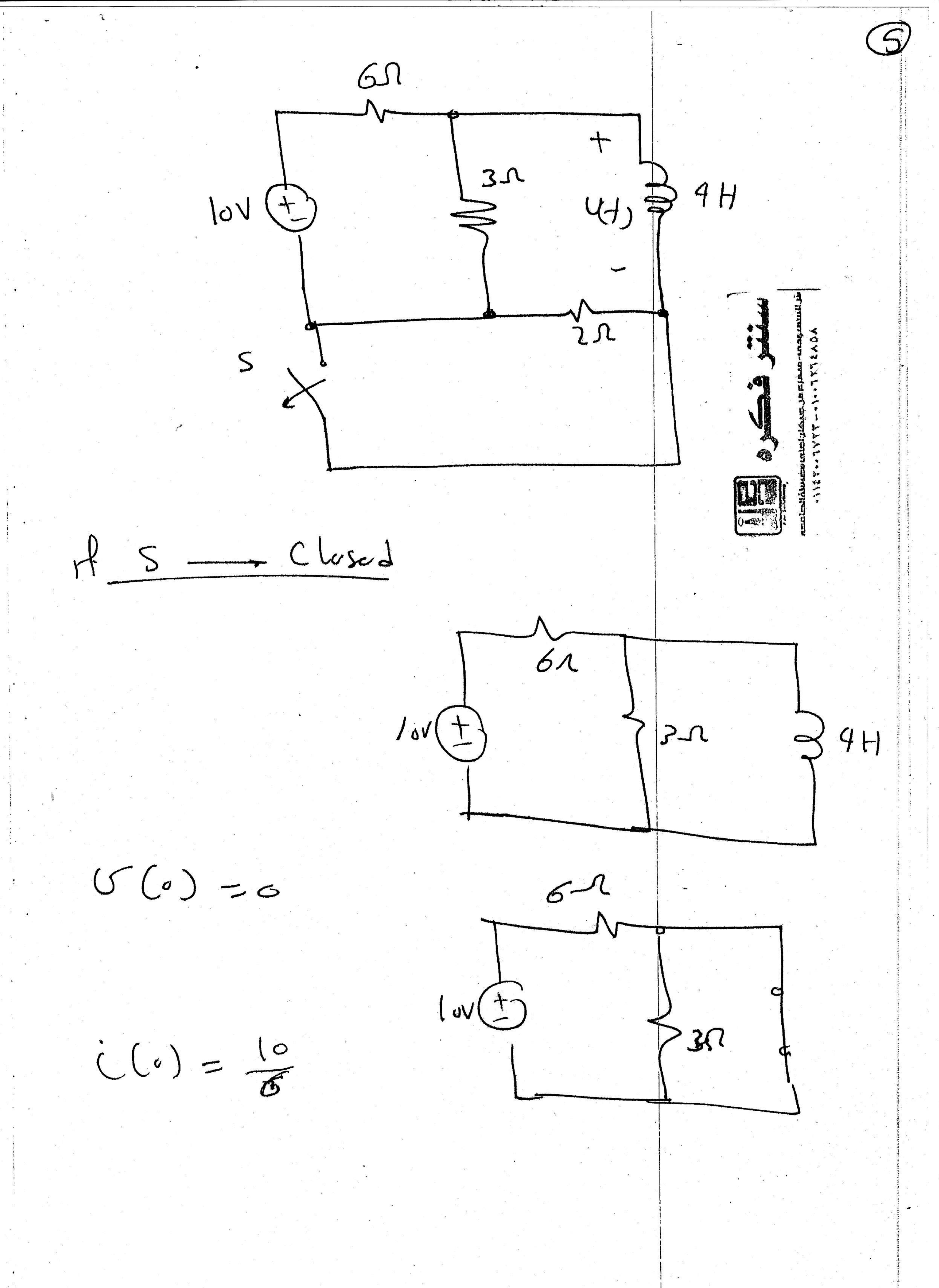
بحل المعادلات نوجد V_a , V_b

$$i = \frac{U_b}{8}$$

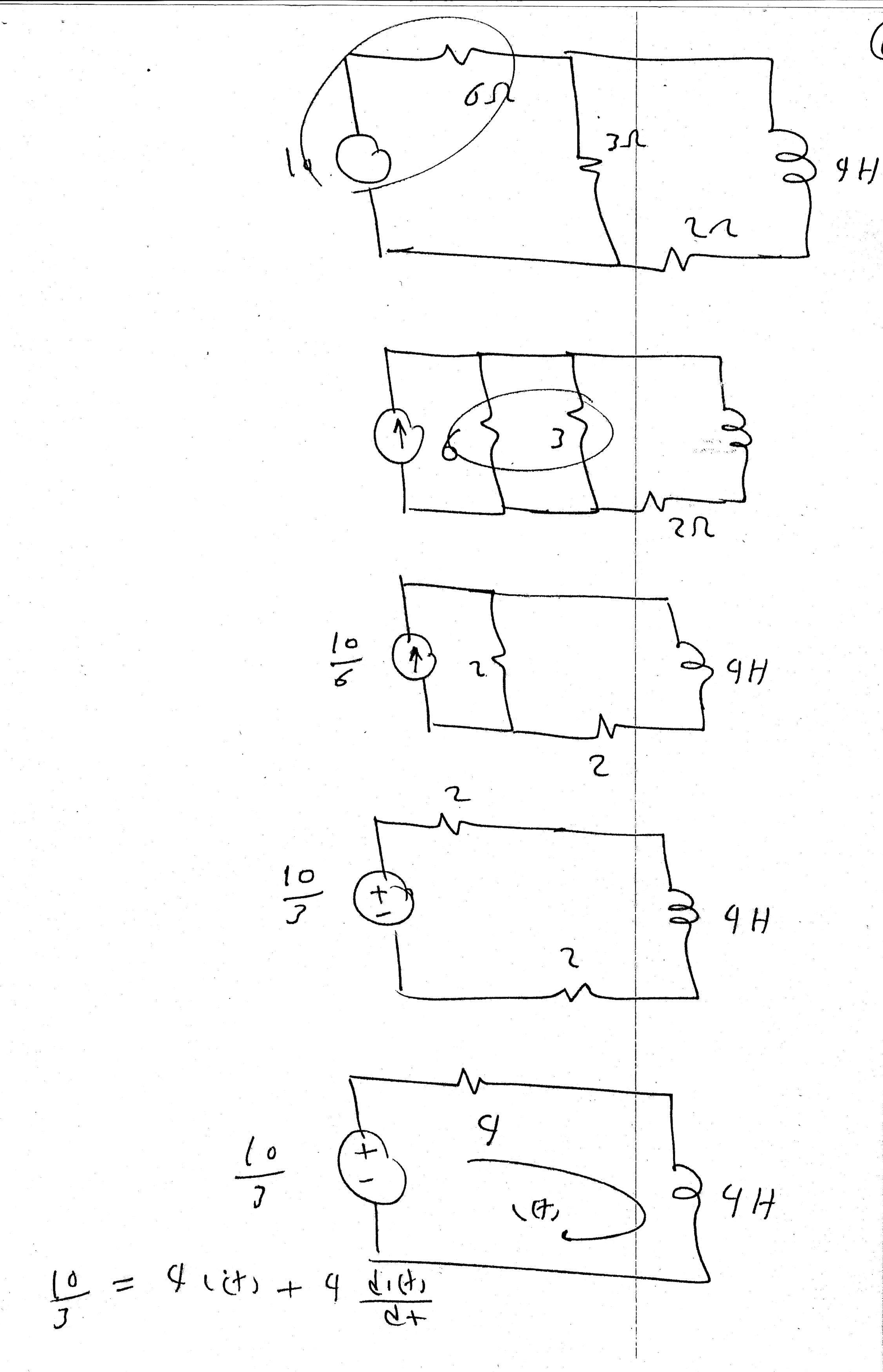
ونحسب i



6Ω
I3
2Ia
Ia
4Ω
I1
15
i
8Ω
I2
1
سنتر فكره
I3
- I3
+ I2 = I3
2
- I1
3
+ 6I3 + 8I2
4
بحل المعادلات نوجد



5
6Ω
3Ω
10V
4H
v(t)
2Ω
S
if S → closed
6Ω
10V
3Ω
4H
v(0) = 0
6Ω
10V
3Ω
i(0) = 10/6



6Ω
3Ω
4H
2Ω
6
3
2Ω
10/6
2
4H
2
2
10/3
4H
2
4
10/3
i(t)
4H
10/3 = 4 i(t) + 4 di(t)/dt

$$\frac{10}{12} = i(t) + \frac{di(t)}{dt}$$

$$i_c(t) = k e^{-at}$$

$$= k e^{-t}$$



$$i_p(t) = A$$

$$\frac{10}{12} = A + 0$$

$$A = \frac{10}{12}$$

$$i(t) = i_c(t) + i_p(t)$$

$$= k e^{-t} + \frac{10}{12}$$

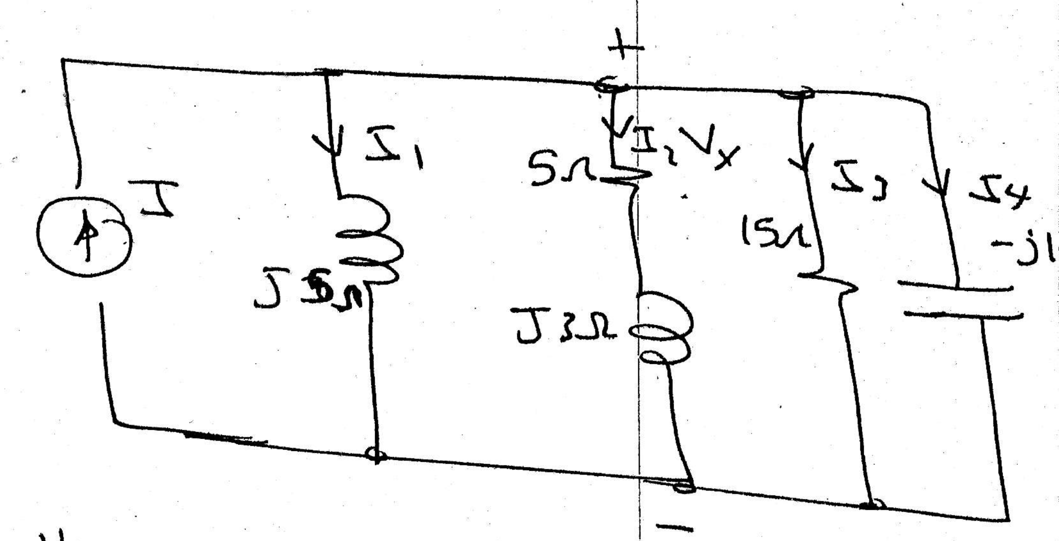
$$i(0) = \frac{10}{6} = k + \frac{10}{12}$$

$$k = \frac{10}{6} - \frac{10}{12}$$

$$\therefore i(t) = ______$$

$$v(t) = L \frac{di(t)}{dt} = 1 \frac{di(t)}{dt}$$

(9)



$P_{5\Omega} = 500$ watt

$P_5 = \frac{|V|^2}{R} = 500 = \frac{|V|^2}{5\Omega} \longrightarrow V^2 = 2500$

$\therefore P_{5\Omega} = |I_2|^2 \cdot R = 500 = I^2 * 5 \qquad I_2^2 = \frac{500}{5}$

$\therefore I_2 = 10\ A$

$\therefore V_x = I_2 * 5 + j3$

$V_x = 10\,(5 + j3)$

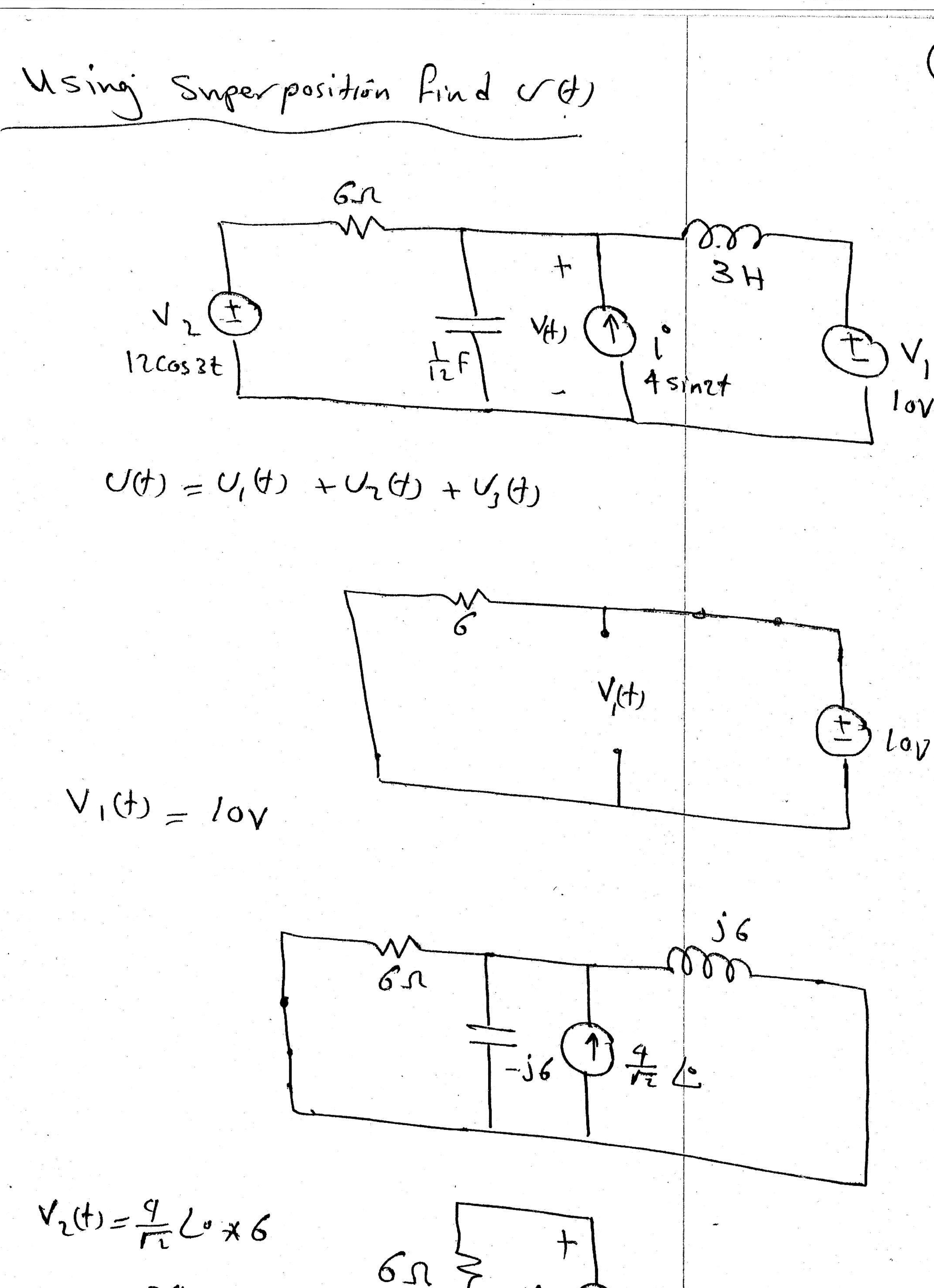
$= 50 + j30$

$\frac{1}{Z_T} = \frac{1}{j5} + \frac{1}{5+j3} + \frac{1}{15} + \frac{1}{-j10}$

$\therefore Z_T = \checkmark$

$I = \frac{V_x}{Z_T}$ $\qquad$ $P.f = \cos\theta_z$

Using Superposition find v(t)



$v(t) = v_1(t) + v_2(t) + v_3(t)$

$V_1(t) = 10V$

$V_2(t) = \frac{4}{\sqrt{2}}\angle 0 \times 6$

$= \frac{24}{\sqrt{2}}\angle 0$

Circuit diagram: a source $\frac{12}{\sqrt{2}}\angle 90^\circ$ in series with a 6 Ω resistor; a $-j4$ capacitor (voltage $v_3(t)$ across it, + at top, − at bottom) in parallel with a $j9$ inductor.

$$V_3(t) = \frac{12}{\sqrt{2}}\angle 90^\circ * \frac{\left((j9 * (-j4)) / j9 - j4\right)}{6 + \left(\frac{j9 * -j4}{j5}\right)}$$

$$\therefore V(t) = V_1(t) + V_2(t) + V_3(t)$$

$$P_{6\Omega} = \frac{V^2}{R} = \frac{(V_2 - V(t))^2}{6\Omega}$$

To find Vth

<u>K.C.L at Vth</u>

$$\frac{V_{th} - 20\angle 45}{4} + \frac{V_{th} - 0}{-j12} = -2I$$

$$\therefore \quad I = 20\angle 45 - V_{th}$$

$$\therefore \frac{V_{th} - 20\angle 45}{4} + \frac{V_{th} - 0}{-j12} = -2(20\angle 45 - V_{th}$$

$$\therefore V_{th} = ___$$

4

v

I

$-j12$

$2I$

v

$\frac{\;}{} + \frac{v - 0}{-j12} \longrightarrow (1)$

$= -\frac{v}{4} \longrightarrow (2)$

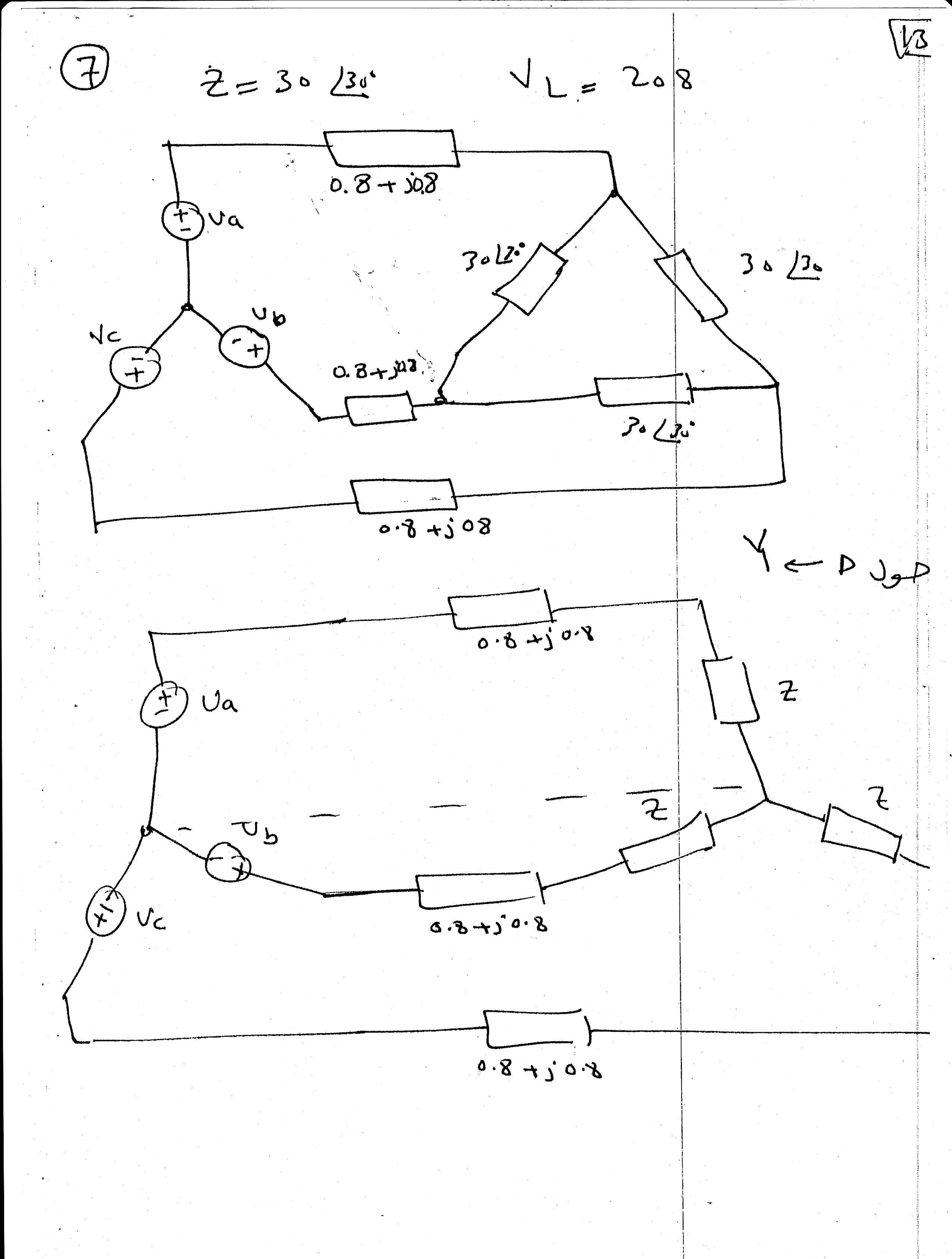
$\frac{v}{4} + \frac{jv}{12}$

$\left(\frac{1}{4} + \frac{j}{12} - \frac{1}{2}\right)$

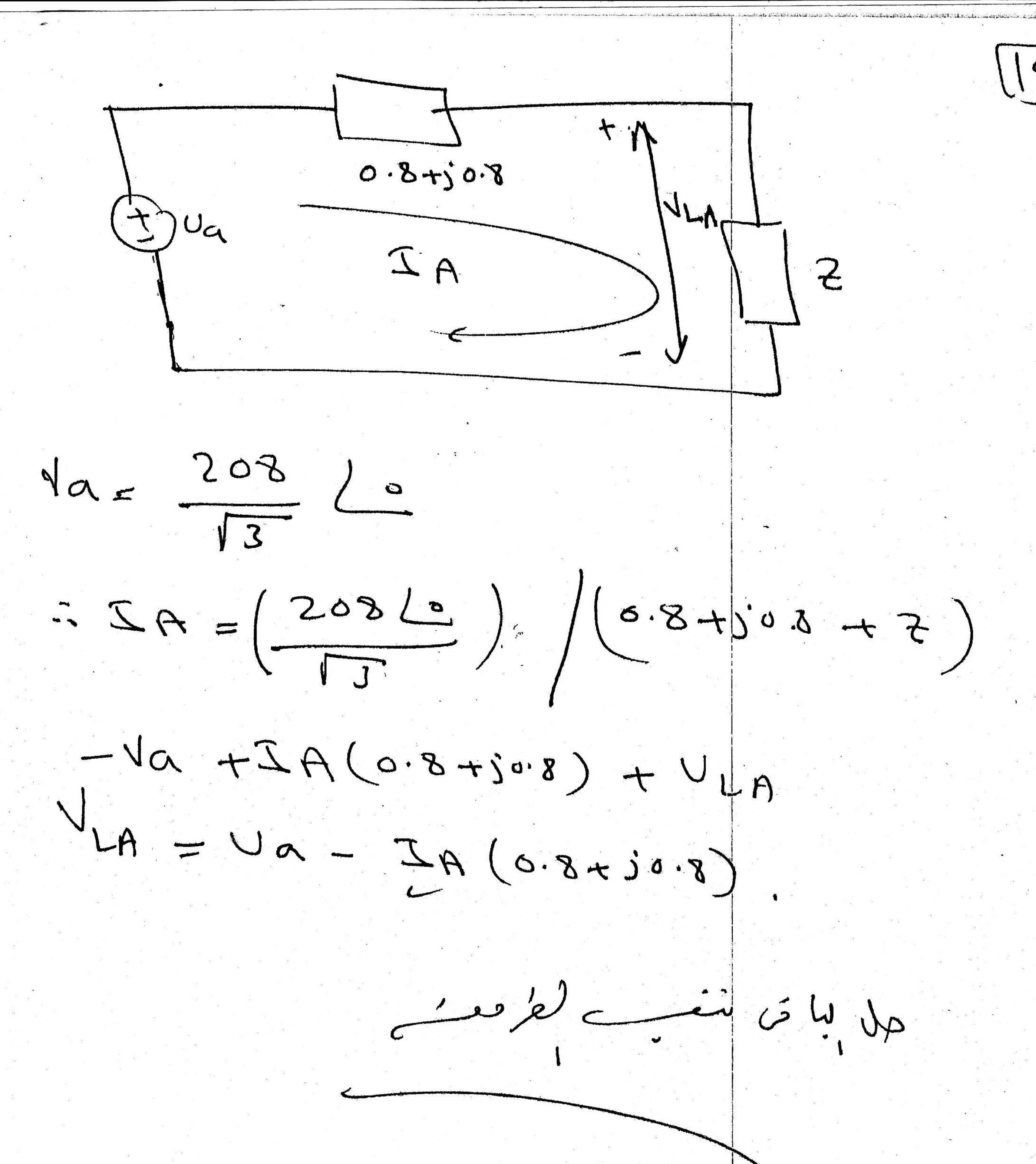
$\frac{1}{\left(\frac{1}{4} + \frac{j}{12} - \frac{1}{2}\right)}$

$\angle \theta_z \longrightarrow R = |\ |$

4 Real Z_L



7
Z = 30 ∠30°
VL = 208
0.8 + j0.8
Va
Vb
Vc
30∠30°
30∠30°
0.8 + j0.8
30∠30°
0.8 + j0.8
Y ← D حول
0.8 + j0.8
Z
Va
Z
Z
Vb
Vc
0.8 + j0.8
0.8 + j0.8



$$V_a = \frac{208}{\sqrt{3}} \angle 0$$

$$\therefore I_A = \left(\frac{208 \angle 0}{\sqrt{3}} \right) \Big/ \left(0.8 + j0.8 + Z \right)$$

$$-V_a + I_A (0.8 + j0.8) + V_{LA}$$

$$V_{LA} = V_a - I_A (0.8 + j0.8)$$

حل باقي تعب الطرفين